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### NOTICE OF ALLOWANCE AND FEE(S) DUE

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LYONDELL CHEMICAL COMPANY 3801 WEST CHESTER PIKE NEWTOWN SQUARE, PA 19073 RECEIVED OIPE/IAP

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EXAMINER

RABAGO, ROBERTO

ART UNIT

PAPER NUMBER

1713

DATE MAILED: 06/27/2005

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/764,941	01/26/2004	Sandor Nagy	88-2060A	9300

TITLE OF INVENTION: OLEFIN POLYMERIZATION IN THE PRESENCE OF A DEHYDROGENATION CATALYST

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	, NO	\$1400	\$300	\$1700	09/27/2005

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. <u>PROSECUTION ON THE MERITS IS CLOSED</u>. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE REFLECTS A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE APPLIED IN THIS APPLICATION. THE PTOL-85B (OR AN EQUIVALENT) MUST BE RETURNED WITHIN THIS PERIOD EVEN IF NO FEE IS DUE OR THE APPLICATION WILL BE REGARDED AS ABANDONED.

### HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL should be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). Even if the fee(s) have already been paid, Part B - Fee(s) Transmittal should be completed and returned. If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

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	Application No.	Applicant(s)
1	10/764,941	NAGY, SANDOR
Notice of Allowability	Examiner	Art Unit
	Roberto Rábago	1713
The MAILING DATE of this communication appear All claims being allowable, PROSECUTION ON THE MERITS IS herewith (or previously mailed), a Notice of Allowance (PTOL-85) NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT R of the Office or upon petition by the applicant. See 37 CFR 1.313	(OR REMAINS) CLOSED in this a or other appropriate communication IGHTS. This application is subject	pplication. If not included on will be mailed in due course. THIS
1. This communication is responsive to		
2. The allowed claim(s) is/are <u>1 and 3-19</u> .		
3. The drawings filed on are accepted by the Examine	er.	
<ul> <li>4. Acknowledgment is made of a claim for foreign priority unally all b) Some* c) None of the:</li> <li>1. Certified copies of the priority documents have 2. Certified copies of the priority documents have 3. Copies of the certified copies of the priority do International Bureau (PCT Rule 17.2(a)).</li> <li>* Certified copies not received:</li> <li>Applicant has THREE MONTHS FROM THE "MAILING DATE" noted below. Failure to timely comply will result in ABANDONN THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.</li> </ul>	e been received. e been received in Application No. cuments have been received in thi of this communication to file a rep	s national stage application from the
5. A SUBSTITUTE OATH OR DECLARATION must be subm INFORMAL PATENT APPLICATION (PTO-152) which giv	nitted. Note the attached EXAMINE res reason(s) why the oath or decla	R'S AMENDMENT or NOTICE OF ration is deficient.
<ul> <li>6. CORRECTED DRAWINGS (as "replacement sheets") mu</li> <li>(a) including changes required by the Notice of Draftspers</li> <li>1) hereto or 2) to Paper No./Mail Date</li> <li>(b) including changes required by the attached Examiner Paper No./Mail Date</li> <li>Identifying indicia such as the application number (see 37 CFR each sheet. Replacement sheet(s) should be labeled as such in</li> <li>7. DEPOSIT OF and/or INFORMATION about the deposit of the property of the</li></ul>	son's Patent Drawing Review (PTo- 's Amendment / Comment or in the  1.84(c)) should be written on the draw the header according to 37 CFR 1.12  Dosit of BIOLOGICAL MATERIAL	e Office action of wings in the front (not the back) of 11(d) must be submitted. Note the
Attachment(s)  1. ☑ Notice of References Cited (PTO-892)  2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)	5. ☐ Notice of Informa 6. ☐ Interview Summa Paper No./Mail [	I Patent Application (PTO-152) ry (PTO-413), Date
<ul> <li>3. Information Disclosure Statements (PTO-1449 or PTO/SB/Paper No./Mail Date 4/26/04</li> <li>4. Examiner's Comment Regarding Requirement for Deposit</li> </ul>	,,	ment of Reasons for Allowance
of Biological Material	9.  Other	

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### **Examiner's Amendment**

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Jonathan Schuchardt on 6/20/2005.

## In the claims:

Cancel claims 2, 20 and 21.

Replace claims 1 and 3 with the following amended versions:

- 1. (currently amended) A process which comprises polymerizing an olefin in the presence of: (a) a single-site or Ziegler-Natta olefin polymerization catalyst; (b) a low-temperature, platinum group dehydrogenation catalyst comprising a metal selected from the group consisting of platinum, palladium, rhodium, ruthenium, osmium, iridium, nickel, and rhenium; and (c) an optional hydrocarbon solvent, under conditions effective to promote:
  - (i) olefin polymerization;
  - (ii) catalytic dehydrogenation of the solvent and/or the resulting saturated oligomer or polymer chains to produce short and/or long-chain alkenes; and
    - (iii) copolymerization of additional olefin with the alkenes; to produce a polyolefin having long-chain branching and/or a density less than about 0.96 g/cm<sup>3</sup>.
- 3. (currently amended) The process of claim 2 1 wherein the transition metal is dehydrogenation catalyst comprises iridium.

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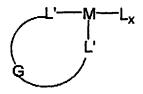
### In the Specification:

Please replace the first paragraph on page 6 with the following <u>amended</u> paragraph:

The olefin polymerization catalyst can be any catalyst system that polymerizes olefins, including Ziegler-Natta or single-site catalysts. Preferably, the olefin polymerization catalyst is a single-site catalyst which comprises an activator and an organometallic complex, wherein the organometallic complex comprises a Group 3 to 10 transition metal and at least one polymerization-stable anionic ligand bonded to the transition metal. The polymerization-stable anionic ligand is preferably selected from the group consisting of cyclopentadienyl, indenyl, fluorenyl, and indenoindolyl ligands. More preferred complexes include a Group 4 transition metal such as titanium or zirconium. Preferably, the organometallic complex has open architecture, preferably it has the general structure:

Please insert the following two  $\underline{\text{new}}$  paragraphs immediately below the structures on page 7:

Preferably, the organometallic complex has the structure:



wherein M is a Group 3 to 10 transition metal; each L is independently selected from the group consisting of halide, alkoxy, aryloxy, siloxy, alkylamino, and  $C_1$ - $C_{30}$  hydrocarbyl; each L' is independently selected from the group consisting of alkylamido, substituted or unsubstituted cyclopentadienyl, fluorenyl, indenyl, boraaryl, pyrrolyl, azaborolinyl, and indenoindolyl; G is a linking group and x satisfies the valence of M.

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Preferably, G is a divalent radical selected from the group consisting of hydrocarbyl and heteroatom-containing alkylene radicals, diorganosilyl radicals, diorganogermanium radicals, and diorganotin radicals. Preferably, one L' is alkylamido and the other L' is selected from the group consisting of substituted or unsubstituted cyclopentadienyl, fluorenyl, indenyl, and indenoindolyl.

In another preferred aspect, the organometallic complex has the general structure:

wherein M is a Group 3 to 10 transition metal; each L is independently selected from the group consisting of halide, alkoxy, aryloxy, siloxy, alkylamino, and  $C_1$ - $C_{30}$  hydrocarbyl; each L' is independently selected from the group consisting of alkylamido, substituted or unsubstituted cyclopentadienyl, fluorenyl, indenyl, boraaryl, azaborolinyl, and indenoindolyl; n is 1 or 2 and x satisfies the valence of M.

Please replace the paragraph bridging pages 7-8 with the following <u>amended</u> paragraph:

The activator helps to ionize the organometallic complex and activate the catalyst. Suitable activators are well known in the art. Examples include alumoxanes (methyl alumoxane (MAO), PMAO, ethyl alumoxane. diisobutyl alumoxane), alkylaluminum compounds (triethylaluminum, diethyl aluminum chloride, trimethylaluminum, triisobutyl aluminum), and the like. Suitable activators include acid salts that contain non-nucleophilic anions. These compounds generally consist of bulky ligands attached to boron or aluminum, and particularly include ionic borates and ionic aluminates. Examples include lithium tetrakis(pentafluorophenyl)borate, lithium tetrakis(pentafluorophenyl)-

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aluminate, anilinium tetrakis(pentafluorophenyl)borate, trityl tetrakis-(pentafluorophenyl)borate, and the like. Suitable activators also include organoboranes, which include boron and one or more alkyl, aryl, or aralkyl groups. Suitable activators include substituted and unsubstituted trialkyl and triarylboranes such as tris(pentafluorophenyl)borane, triphenylborane, tri-n-octylborane, and the like. These and other suitable boron-containing activators are described in U.S. Pat. Nos. 5,153,157, 5,198,401, and 5,241,025, the teachings of which are incorporated herein by reference. Suitable activators also include aluminoboronates—reaction products of alkyl aluminum compounds and organoboronic acids—as described in U.S. Pat. Nos. 5,414,180 and 5,648,440, the teachings of which are incorporated herein by reference. Alumoxane activators, such as MAO, are preferred.

Please replace the first paragraph on page 9 with the following <u>amended</u> paragraph:

Preferred olefins for the polymerization are ethylene and  $C_3$ - $C_{20}$   $\alpha$ -olefins such as propylene, 1-butene, 1-pentene, 1-hexene, 1-octene, and the like. Mixtures of olefins can be used. Ethylene and mixtures of ethylene with  $C_3$ - $C_{10}$   $\alpha$ -olefins are especially preferred.

Please replace the third paragraph on page 9 with the following <u>amended</u> paragraph:

The polymerizations can be performed over a wide temperature range, such as about -30°C to about 280°C. A more preferred range is from about 30°C to about 180°C; most 250°C, even more preferably from about 30°C to about 160°C. Most preferred is the range from about 60°C to about 100°C. Olefin partial pressures normally range from about 0.1 MPa to about 350 MPa. More preferred is the range from about 0.1 MPa to about 7 MPa.

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### Reasons for Allowance

2. The following is an examiner's statement of reasons for allowance. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

The prior art has established that transition metal pincer complexes are effective dehydrogenation catalysts for the conversion of alkanes to alkenes (C. Jensen, Chem. Commun. 1999). Also recognized is the usefulness of using a two-catalyst system for olefin copolymerization comprising a first catalyst for in-situ generation of comonomers and a second catalyst for copolymerization of the olefins with the comonomers (US 6,586,541). However, the prior art cited on this record has not disclosed a process of olefin copolymerization wherein polymerization occurs in the presence of a dehydrogenation catalyst producing alkene, and a copolymerization catalyst which produces copolymer from the olefin and the alkene produced by dehydrogenation.

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberto Rábago whose telephone number is (571) 272-1109. The examiner can normally be reached on Monday - Friday from 8:00 - 4:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on (571) 272-1114. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Roberto Rábago Primary Examiner Art Unit 1713

RR June 20, 2005

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m	AA	6,294,495	09/25/01	Matsunaga	502	103	04/29/99			
	AB	5,902,866	05/11/99	Nagy et al.	526	133	11/13/96			
	AC	5,780,701	07/14/98	Kaska et al.	585	654	07/26/96			
	AD	5,648,440	07/15/97	Sugano et al.	526	132	03/01/95			
	AE	5,637,659	06/10/97	Krishnamurti et al.	526	133	05/17/96			
	AF	5,539,124	07/23/96	Etherton et al.	548	402	12/19/94	-		
	AG	5,414,180	05/09/95	Geerts et al.	585	525	07/14/93			
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	AJ	5,153,157	10/06/92	Hlatky et al.	502	117	03/20/90			
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Form PTO-1449 U.S	S. Depa	rtment of Comm	erce	Attorney Docket: 88-2060	)A		Examiner: Unkn	own
Rev. 7/89	Patent	and Trademark	Office	Serial No. 10/764,941			Filing Date: 01/26/04	
LIST OF PRIOR	ABIC	SITED BY APP	LICANT	Applicant: Sandor Nagy			Group Art: Unkr	nown
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	<u></u>	OTHER PRIO	R ART (In	cluding Author, Title, E	ate, Pertin	ent Pages, E	tc.)	-
RR	AP	D. Baudry et a	ıl., <u>J. Chen</u>	n. Soc., Chem. Commun. (1	983) 788.			
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120	AR	M. Gupta et a	., <u>J. Am. C</u>	hem. Soc. 119 (1997) 840.	·			
Examiner Cok	ert	Tah	1	Date Considered	120/0	5		

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

# Notice of References Cited Application/Control No. 10/764,941 Examiner Roberto Rábago Applicant(s)/Patent Under Reexamination NAGY, SANDOR Page 1 of 1

### U.S. PATENT DOCUMENTS

*		Document Number	Date	Name	Classification
		Country Code-Number-Kind Code	MM-YYYY		
	Α	US-6,586,541 B2	07-2003	Citron, Joel David	526/113
	В	US-			
	С	US-			
	D	US-			
	Ε	US-			
	F	US-			
	G	US-			
	н	US-			
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	J	US-			
	К	US-			
	L	US-			
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### FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
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#### **NON-PATENT DOCUMENTS**

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)							
х	C	C. Jensen, Chem. Commun. (1999) 2443-2449.							
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\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).) Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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10/764,941	01/26/2004	Sando	or Nagy	88-2060A	9300		
TITLE OF INVENTION: O	LEFIN POLYMERIZATION	N IN THE PRESENCE OF A D	DEHYDROGENATION CATA	LYST			
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.	
10/764,941	01/26/2004	Sandor Nagy	88-2060A	9300	
24114	7590 06/27/2005	06/27/2005 E			
	CHEMICAL COMPAN	RABAGO, ROBERTO			
3801 WEST CHESTER PIKE NEWTOWN SOUARE, PA 19073			ART UNIT	PAPER NUMBER	
			1713		
			DATE MAILED: 06/27/2005		

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)

(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 93 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 93 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571) 272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (703) 305-8283.